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(54) Title: AN ANTI-REWET FELT FOR USE IN A PAPERMAKING MACHINE

(57) Abstract: An anti-rewet fabric is used for carrying a fiber web through an air press. The anti-rewet fabric includes at least one air distribution fabric layer, one air distribution fabric layer being configured for contacting the fiber web, and a perforated film layer and/or a spectra membrane, at least the perforated film layer being made of a polymeric or polyester film. At least the perforated film layer has a first film side and a second film side, the first film side being one of laminated and attached to the one air distribution fabric layer.

## An anti-rewet felt for use in a papermaking machine

### Background of the invention

#### 5    1. Field of the invention

The present invention relates to fabrics used in papermaking machines, and, more particularly, to fabrics used to carry fiber or, more particularly, paper webs through a drying press. The present invention is particularly  
10    advantageous for tissue paper.

#### 2. Description of the related art

For many years attempts have been made to use external air pressure to  
15    force water out of a paper web. Rather than compress a sheet at a press nip to the point where hydraulic pressure drives water out, as is the case in normal wet pressing, it was reasoned that more water could be removed, and sheet bulk could be maintained, if air pressure could be applied to supplement roller nip generated hydraulic pressures. One such  
20    attempt involves providing a multi-roller or other structure forming an air press having a closed chamber, wherein air is circulated through the chamber to convect moisture out of the paper web. Such air presses typically carry the paper web sandwiched between an upper pressing fabric and a lower anti-rewet layer.

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Much attention has been given to the design of the pressing fabric and its characteristics. The construction of the pressing fabric has been thought to be the most important of the above-mentioned fabrics since it controls

mechanical pressure on the paper web and the air flow therethrough. However, experimentation has shown the importance of the underneath anti-rewet layer. It has been found that rewet can have a profound effect on sheet solids after pressing. Specifically, the quality of the paper web  
5 has been found to decrease with increasing rewet. Sheet rewet can be controlled by the design of the anti-rewet layer.

What is needed in the art is an anti-rewet layer for use in air presses which can effectively minimize the amount of rewet which occurs in a fiber  
10 web during and after pressing thereof in a drying press.

### **Summary of the invention**

The present invention provides an anti-rewet fabric or felt that includes at  
15 least one air distribution layer laminated or otherwise attached to a perforated film layer and/or a spectra membrane, the anti-rewet fabric having a low enough permeability and constructed so that water cannot be attracted back into a fiber web carried thereby through an air press.

20 The invention comprises in one form thereof, an anti-rewet felt for carrying a fiber web through an air press. The anti-rewet felt includes at least one air distribution layer, one air distribution layer being configured for contacting the fiber web, and a perforated film layer and/or a spectra membrane, at least the perforated film layer being made of a polymeric or a  
25 polyester film or any other film or the like. The perforated film layer has a first film side and a second film side, the first film side being one of laminated and attached to the one air distribution layer. If a spectra mem-

brane is used, preferably the same may be the case with this spectra membrane.

Such a spectra membrane can in particular have the design and be manufactured as is described in GB 2 305 156 A in connection with the Fig. 3  
5 there and in GB 2 235 705 B. The two publications just mentioned are herewith incorporated by reference in the content of the present application.

10 The spectra membrane can therefore in particular be a membrane having a regular, non-woven structure through which suction is possible. It can be provided with spun reinforcement threads which extend through the mesh structure in the running direction of the web (cf. in particular Fig. 3 of GB 2 305 156 A). This spectra membrane can in particular be a porous,  
15 reinforced membrane made of a composite material, with spun threads or yarns extending in machine direction forming the reinforcement elements and the surrounding matrix material containing fluid passages, fully encapsulating the spun threads and connecting together spun thread by spun thread in order to produce the non-woven spectra membrane (cf. in  
20 particular GB 2 235 705 B). The spectra membrane can also in particular be designed and manufactured in other respects as is described in GB 2 305 156 A and GB 2 235 705 B.

In another form thereof, the invention comprises a papermaking machine  
25 for making a fiber web. The papermaking machine includes a plurality of conveyor rolls for carrying the fiber web and first and second opposing press elements. The first press element and second press element together form a nip therebetween. The papermaking machine further includes at

least a first anti-rewet layer configured for carrying the fiber web through the nip. The first anti-rewet felt includes at least one air distribution fabric layer, one air distribution fabric layer being configured for contacting the fiber web, and a perforated film layer and/or a spectra membrane, at least  
5 the perforated film layer being made of a polymeric or polyester film or any other film or the like. The perforated film layer has a first film side and a second film side, the first film side being one of laminated and attached to the one air distribution fabric layer, the second film side being directed toward one press element. If a spectra membrane is used, preferably the  
10 same may be the case with this spectra membrane.

In another form thereof, the invention comprises a method of conveying a fiber web into an air press, the air press having a nip. The method includes the step of providing an anti-rewet felt for carrying the fiber web  
15 through an air press. The anti-rewet felt includes at least one air distribution fabric layer configured for contacting the fiber web and a perforated film layer and/or a spectra membrane, the perforation film layer being made of a polymeric or polyester film, or any other film or the like. The perforated film layer has a first film side and a second film side, the first  
20 film side being one of laminated and attached to one the air distribution fabric layer and/or a spectra membrane. The method further includes the step of carrying the fiber web on one air distribution fabric layer of the anti-rewet felt into the air press through the nip.

25 An advantage of the present invention is rewet of the fiber web after water has been removed therefrom can be greatly minimized.

A further advantage is that the perforated film layer and/or the spectra membrane of the anti-rewet felt or fabric increases the average air flow path length through the fabric.

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**Brief description of the drawings**

The above-mentioned and other features and advantage of this invention, and the manner of attaining them, will become more apparent and the invention will be better understood by reference to the following description of embodiments of the invention taken in conjunction with the accompanying drawings, wherein:

- Fig. 1 is a side view of a first embodiment of a papermaking machine of the present invention;
- 15 Fig. 2 is a schematic, exploded side view of the first fabric shown in Fig. 1;
- Fig. 3 is a schematic, exploded view of a first embodiment of the first fabric shown in Fig. 2;
- 20 Fig. 4 is a schematic, exploded view of a first embodiment of the first fabric shown in Fig. 2;
- Fig. 5 is a schematic, exploded view of a second embodiment of the first fabric shown in Fig. 1;
- 25 Fig. 6 is a side view of a second embodiment of a papermaking machine of the present invention;

Fig. 7 is a schematic partial view of a multi-layer anti-rewet structure which allows to make splices; and

Fig. 8 is a schematic partial view of an exemplary embodiment of a spectra membrane.

Corresponding reference characters indicate corresponding parts throughout the several views. The exemplifications set out herein illustrate at least one preferred embodiment of the invention, in one form, and such exemplifications are not to be construed as limiting the scope of the invention in any manner.

### Detailed description of the invention

Referring now to the drawings, and more particularly to Fig. 1, there is shown a papermaking machine 10 for forming a fiber web 12 which generally includes an air press 14, a plurality of conveyor rolls 16, a first fabric 18 and a second fabric 20.

Air press 14 includes a first main roll 22, a second main roll 24, and a pair of cap rolls 26. First main roll 22 and cap rolls 26 together define an enclosure 28. Second main roll 24 acts as a counter element for enclosure 28. Enclosure 28 and second main roll 24 conjunctively define air press chamber 30 with air press chamber 30 having a pressurized fluid or gas (e.g. air, steam or a heated gas) therein. Second main roll 24 coacts with each of cap rolls 26 to define a pair of nips 32 through which first fabric 18, second fabric 20 and paper web 12 are conveyed. Second main roll 24 is a vented roll, a vented roll being a roll that is at least one of vented,

grooved, blind drilled, drilled or connected to a source of suction in order to promote drainage therethrough.

Conveyer rolls 16 and second main roll 24 together carry first fabric 18,  
5 second fabric 20 and paper web 12 to, through and beyond air press 14. First fabric 18 is positioned between paper web 12 and second main roll 24, while second fabric 20 is arranged between paper web 12 and air press chamber 30.

10 First fabric 18 is an anti-rewet fabric or felt and is at least a two-layer fabric. First fabric 18 is designed so that water cannot be readily attracted back into fiber web 12 by web sheet expansion or web sheet capillary forces. First fabric 18 includes at least one air distribution fabric layer 34 (Fig. 2) and a perforated film layer 36, one air distribution fabric layer 34  
15 being configured for contacting fiber web 12. Conversely, perforated film layer 36 should always be kept away from paper web 12 so as to not adversely affect the paper forming process. As an anti-rewet fabric, first fabric 18 is configured for promoting a one-way flow of water there-  
through, allowing first fabric 18 to be used to direct the flow of water away  
20 from fiber web 12.

Instead of or in addition to the perforated film layer 36 a spectra membrane could be used. A schematic partial view of an exemplary embodiment of said a spectra membrane 88 is shown in Fig. 8. The spectra mem-  
25 brane 88 has the thickness  $d$  and can, for example, comprise holes 90.

Such a spectra membrane also works in the anti-rewet layer. Some good results could be achieved where a fabric has been laminated to the spectra membrane. The spectra grid acts like the perforated layer.

- 5 The spectra membrane provides a void structure that holds water away from the diffusion layer. The spectra voids provide a protected, quiet area for the water to reside as the fabric travels around rolls at high speed. The spectra membrane can have open areas that are quite large. The open area should be limited so that water speeds up and is ejected from the
- 10 diffusion layer. The amount of speed needed to do this depends on air flow, and capillary structure of the diffusion layer. The structure needs to break water contact with the diffusion layer, and then the water should be captured in the backside fabric.
- 15 Each air distribution fabric layer 34 is advantageously a polyester fabric and a sateen fabric favorably. A plain weave 38 (Fig. 3) may be used for each air distribution fabric layer 34, but a multi-float weave 40 (Fig. 4) is much preferred. Multi-float weave 40 is also known as a multi-shed weave with a five-shed weave, in particular, being illustrated in Fig. 4. Multi-float
- 20 weave 40 is preferred because such a weave provides for a longer flow path of air and thereby has a higher distribution effect associated therewith. Alternatively, each air distribution layer 34 may be formed of a non-woven fabric, so long as such fabric spreads the air sufficiently. One air distribution fabric layer 34 found to be favorable has a sateen weave, a
- 25 thickness of about 0,022 inches, when combined with a perforated layer with, a hole pattern of about 300 holes/sq. inch and an open area of about 19 %, resulting in an air permeability of about 40 cfm or a comparable spectra membrane.

Air distribution fabric layer 34 adjacent paper web 12 is favorably a fabric that holds low amounts of water and provides adequate airflow and fabric dewatering. The more resistive such air distribution fabric layer 34 is to  
5 airflow, the more back pressure there is, and, hence, the less water is removed from paper web 12. It is desired not to impede the flow of water out of paper web 12, so the permeability of the materials used for such air distribution fabric layer 34 should be high enough to provide for adequate fabric dewatering. If the permeability thereof is too high, however, the  
10 sheet side of air distribution fabric layer 34 will not dewater well since air will take short circuit paths therethrough, leaving water therein.

Perforated film layer 36 favorably is a polymeric or polyester film (e.g. a film of material sold under the trade name "Mylar" ®) or a plastic film and  
15 has a first film side 42 and a second film side 44. For example, first a polymeric or polyester film is coated with adhesive on one or both sides, and then the structure is perforated. First film side 42 is one of laminated and attached to air distribution fabric layer 34 configured for contacting fiber web 12. Perforated film layer 36 has a plurality of perforate holes 46  
20 formed therein. Perforated film layer 36 preferably includes more than about 40.000 holes/m<sup>2</sup> and more preferably more than about 200.000 holes/m<sup>2</sup>, thereby resulting in an open area in the approximate range of 1 to 30 %, preferably 5 to 15 %. Perforated film layer 36 preferably has a film thickness 48 of less than about 0,04 inches and ideally less than  
25 about 0,005 inches.

In perforated film layer 36, each set of most-closely spaced perforate holes 46 is separated by a perforate distance 50. Additionally, each air distribution fabric layer 34 has one of plain weave 38 and a multi-float weave 40

associated therewith, plain weave 38 having a plain weave repeat distance 52 and multi-float weave 40 having a multi-float weave repeat distance 54. In order to maximize air distribution, plain weave repeat distance 52 and multi-float weave repeat distance 54 each are preferably at least substantially equal to and, most preferably, greater than perforate distance 50. In fact, the weave pattern chosen for each air distribution fabric layer 34 favorably should spread air further than perforate distance 50. As such, long floats in the weave pattern promote good spreading. In the embodiments illustrated in Fig. 3 and 4, plain weave repeat distance 52 is equal to perforate distance 50, and multi-float weave repeat distance 54 is greater than perforate distance 50.

First fabric 18 works as an anti-rewet layer because the air pressure forces water in paper web 12 and first fabric 18 to pass through perforate holes 46, with the water then being deposited on the side of perforate film layer 36 facing away from paper web 12. The flow of air also causes a break in the contact between this water, paper web 12 and air distribution fabric layer 34 adjoining paper web 12. Because of this break, water is not attracted back in the air distribution fabric layer 34 by capillary forces to rewet paper web 12. It is necessary to have adequate space for the water to reside after it passes through perforate holes 46, so the open area (not labeled) of perforate film layer 34 and the perforate hole size cannot be too big. As mentioned above, a spectra membrane can be provided instead of or in addition to said perforated film layer 36.

In principle, anti-rewet fabrics having more than two layers could also be used. The two layer structure works very well. However, it can be improved upon. For example:

The perforated backside layer (e.g. layer 36 in Fig. 2), does not have receptacles for the water. Water will pass back into the diffusion or air distribution fabric layer if the backside water is disturbed, which easily happens at high speed. The addition of a third backside layer that is very coarse can help protect the water layer.

The backside perforations do not distribute the air as it flows into the vented roll. If a perforation is over a land area in the roll, no air will flow through that perforation. To prevent this, the roll surface should be rough, or a fabric layer can be used to distribute the air.

A multi-layer anti-rewet structure allows one to make splices (cf. Fig. 7). Each layer a, b, c, ... can be cut yet the other layers will continue to carry the load if they are not all cut in the same area.

Such a multi layer structure could be, for example, as follows: air distribution layer/perforated film layer and/or spectra membrane/air distribution layer/perforated film layer and/or spectra membrane. Preferably a final backside water holding air distribution layer is provided. The final backside layer holds the water and diffuses the air. This works almost as well as the two layer structure. The long path and directed flow by the perforations in this structure helps to reduce rewet.

In principle, a perforated film layer 36 can comprise a polymeric or polyester film coated with adhesive 84 (cf., e.g., Fig. 2) on one or both sides and holes 46 put through both the polymeric or polyester film and the adhesive 84.

Thus, with the method used first a polymeric or polyester film is coated with adhesive on one or both sides, and then the received composite is perforated. This method puts holes through both the film and the adhesive.  
5

Second fabric 20 is advantageously an anti-rewet fabric or felt of similar construction and properties as first fabric 18 except for certain features discussed herein. Second fabric 20 favorably acts as a transfer fabric for  
10 transferring fiber web 12 to a next station (not shown) of papermaking machine 10. Second fabric 20, as seen from Fig. 5, is a three-layer fabric having one resistance layer 86, a perforated layer 36 and an air distribution fabric layer 34.

15 The resistive layer 86 is toward the chamber 30, and the distribution fabric layer 34 is toward the sheet of paper. The purpose of the membrane layer 20 is to limit air flow. The flow resistance layer 86 and perforations together act to limit the flow, since air flows only in the hole area.

20 Said perforated layer 36 again can be coated with adhesive. Resistance layer 86 and air distribution fabric layer 34 are attached to first film side 42 and second film side 44 of perforated film layer 36, respectively, with the adhesive layers bonding the entire structure together at this point. First fabric 18 and second fabric 20 have a first permeability and a second  
25 permeability, respectively, the first permeability being equal to or greater than the second permeability. Normally it is desired to press the sheet to gain additional water removal, so to do this, fabric 20 preferably should have the lowest permeability practical and fabric 18 preferably should

have the highest permeability practical, so the combine permeability limit the air flow to the needed amount. Second fabric 20 need not be an anti-rewet layer to achieve adequate results. Second fabric 20 could instead, for example, be a permeable material.

5

Second fabric 20 could be used in lieu of first fabric 18 in a design in which only one such fabric is used.

10

Advantageously, at least one of first fabric 18 and second fabric 20 is an embossed imprinting fabric that is able to give fiber web 12 a three-dimensional structure such as raised or indented lettering and/or an embossed decorative design. The presence of a three-dimensional structure is advantageous in the production of towel tissue in a tissue paper machine, helping to increase the water absorbency capacity and rate.

15

Preferably, first fabric 18 and/or second fabric 20 would be an imprinting fabric. If a spectra membrane is used, this spectra membrane having a molded structure could be molded with the pattern needed.

20

In operation, fiber web 12 is carried between first fabric 18 and second fabric 20 into one nip 32 of air press 14 by conveyor roll 16. Once inside air press chamber 30 of air press 14, the air pressure within air press chamber 30, as well as the mechanical pressure exerted at each of nips 32, forces water out of fiber web 12 as it is conveyed upon second main roll 24. Since first fabric 18 and second fabric 20 are anti-rewet felts or fabrics, the water forced out of fiber web 12 is substantially unable to return to and thus rewet fiber web 12. Fiber web 12 is conveyed out of air press 14 through another nip 32 toward a further conveyor roll 16. Con-

25

veyor roll 16 helps propel fiber web 12 toward a next processing station (not shown).

A second embodiment of a papermaking machine is shown in Fig. 6.

5 Papermaking machine 60 for forming a fiber web 62 which generally includes an air press 64, a plurality of conveyor rolls 66, a first fabric 68 and a second fabric 70. Papermaking machine 60 differs from papermaking machine 10 with respect to the air press employed by each. Consequently, only those features related to air press 64 and the operation  
10 thereof are discussed in any detail with respect to this embodiment.

Air press 64 includes a box enclosure 72 and an adjacently positioned counter element 74. Counter element 74 is a shoe, a vented box or a suction box (such terms often being used somewhat interchangeably in  
15 the art). Box enclosure 72 has a plurality of seals 76 mounted thereon adjacent counter element 74. Seals 76 of box enclosure 72 and counter element 74 together define a plurality of nips 78 through which fiber web 62, first fabric 68 and second fabric 70 are able to pass. Box enclosure 72 and counter element 74 together define air press chamber 80. Air press  
20 chamber 80, like air press chamber 30, has a pressurized fluid therein.

In principle, it is possible to make membranes with more than three layers. It would be possible to have a multi layer membrane with the following construction where each successive layer adds to the total resistance  
25 of the structure: resistive layer/perforated film layer and/or spectra membrane/air distribution fabric layer/perforated film layer and/or spectra membrane/air distribution fabric layer.

Permeability can, e.g., be varied or controlled by changing the registration of the holes in the successive perforation layers in a multi layer membrane. For example, in the multi layer structure as mentioned before, it would be possible to adjust the permeability at time of manufacture, by  
5 offsetting the holes in the two perforation layers. With the two perforation layers' holes lined up, the permeability would be higher than if the perforation did not line up.

As can be seen from the above, preferably a pressurized zone is used.  
10 Such a pressurized zone is much more effective than a vacuum box to create air flow. The air pressure in the chamber drives the flow of air so that no vacuum box is needed. Only a 'vent' box is needed to collect the air and exhaust it to atmospheric pressure – suction is not necessary, but could be used.

15

While this invention has been described as having a preferred design, the present invention can be further modified within the spirit and scope of this disclosure. This application is therefore intended to cover any variations, uses, or adaptations of the invention using its general principles.  
20 Further, the application is intended to cover such departures from the present disclosure as come within known or customary practice in the art to which this invention pertains and which fall within the limits of the appended claims.

25

Claims

1. A press unit for dewatering a fiber web, said press unit comprising:  
first and second opposing press elements, said first press element  
5 and said second press element together forming a nip therebetween;  
at least one anti-rewet fabric configured for carrying the fiber web  
through said nip, each said anti-rewet fabric having a first fabric  
side and a second fabric side, each said anti-rewet fabric including:  
10 at least one air distribution fabric layer, one air distribution fabric  
layer being configured for contacting the fiber web; and  
  
a perforated film layer and/or a spectra membrane, at least said  
perforated film layer being comprised of one of a polymeric or poly-  
15 ester film and a plastic film, at least said perforated film layer hav-  
ing a first film side and a second film side, said first film side being  
one of laminated and attached to said one air distribution fabric  
layer, said second film side being directed toward one of said first  
and second press elements.  
20
2. The press unit of claim 1,  
wherein the structure of said spectra membrane is such that water  
contact with the distribution fabric layer is broken.
- 25 3. The press unit of claim 1 or 2,  
wherein said anti-rewet fabric comprises more than two layers.

4. The press unit of claim 3,  
wherein said anti-rewet fabric comprises a third backside layer that  
is very coarse.
- 5 5. The press unit of claim 3,  
wherein a backside air distribution fabric layer is provided.
6. The press unit of any one of the preceding claims,  
wherein the press unit, preferably a vented roll, preferably disposed  
10 on the backside of the anti-rewet fabric, has a rough surface.
7. The press unit of any one of the preceding claims,  
wherein said anti-rewet fabric comprises a multi layer structure as  
follows: air distribution layer/perforated film layer and/or spectra  
15 membrane/air distribution layer/perforated film layer and/or spec-  
tra membrane.
8. The press unit of claim 7,  
wherein a final backside water holding air distribution layer is pro-  
20 vided.
9. The press unit of any one of the preceding claims,  
wherein said perforated film layer comprises a polymeric or polyes-  
ter film layer comprises a polymeric or polyester film coated with  
25 adhesive on one or both sides and holes put through both the poly-  
meric or polyester film and the adhesive.

10. The press unit of any one of the preceding claims,  
wherein said first press element is an enclosure, said second press  
element being a counter element positioned opposite said enclosure,  
said second film side being directed toward said counter element.
- 5 11. The press unit of claim 10,  
wherein said enclosure contains a pressurized fluid.
12. The press unit of claim 11,  
10 wherein said pressurized fluid is at least one of air, steam and a  
heated gas.
13. The press unit of any one of the preceding claims,  
wherein said enclosure includes three juxtaposed rolls and said  
15 counter element is a fourth roll further juxtaposed to said three jux-  
taped rolls of said enclosure, said press unit thereby defining a  
four-roll press arrangement.
14. The press unit of any of the claims 10 to 12,  
20 wherein said enclosure is a box having a pressurized fluid therein  
and said counter element is one of a roll, a shoe, a vented box and a  
suction box.
15. The press unit of any one of the preceding claims,  
25 wherein said counter element is one of a roll, a shoe and a vented  
box.

16. The press unit of claim 15,  
wherein said counter element is a roll, said roll being at least one of  
vented, grooved, blind drilled, drilled, and connected to a source of  
suction.
- 5
17. The press unit of any one of the preceding claims,  
wherein said at least one anti-wet fabric includes a first anti-rewet  
fabric, said press unit further comprising a second fabric, said first  
anti-wet fabric being configured so as to be arranged between the fi-  
10 ber web and said counter element, said second fabric configured so  
as to be arranged between the fiber web and said enclosure.
18. The press unit of claim 17,  
wherein the press unit is part of a papermaking machine, said  
15 second fabric or said first fabric being configured for transferring the  
fiber web to a next station of said papermaking machine.
19. The press unit of any one of the preceding claims,  
wherein said first anti-wet fabric and said second anti-wet fabric  
20 have a first permeability and a second permeability, respectively,  
said first permeability being one of equal to and greater than said  
second permeability.
20. The press unit of any one of the preceding claims,  
25 wherein said second fabric comprises a resistive layer, a perforated  
film layer and/or a spectra membrane, and an air distribution fabric  
layer.

21. The press unit of claim 20,  
wherein said resistive layer is toward the first press element or  
enclosure and said air distribution fabric layer is toward the fiber  
web.
- 5 22. The press unit of any one of the preceding claims,  
wherein said second fabric comprises more than three layers.
- 10 23. The press unit of claim 22,  
wherein said second fabric comprises a multi layer structure as  
follows: resistive layer/perforated film layer and/or spectra mem-  
brane/air distribution fabric layer/perforated film layer and/or  
spectra membrane/air distribution fabric layer.
- 15 24. The press unit of any one of the preceding claims,  
wherein at least one fabric comprises at least two of perforated film  
layers and/or spectra membranes and the permeability is adjusted  
by the registration of the holes in successive perforated film layers  
or spectra membranes.
- 20 25. The press unit of any of the preceding claims,  
wherein at least one fabric is constructed for pattern pressing.
- 25 26. The press unit of claim 25,  
wherein said fabric comprises a spectra membrane molded with the  
pattern.

27. An anti-rewet fabric for carrying a fiber web through an air press, the anti-rewet fabric comprising:  
at least one air distribution fabric layer, one said air distribution fabric layer being configured for contacting the fiber web; and  
5 a perforated film layer and/or a spectra membrane, at least said perforated film layer being comprised of one of a polymeric or polyester film and a plastic film, at least said perforated film layer having a first film side and a second film side, said first film side being one of laminated and attached to said one said air distribution fabric layer.  
10
28. The anti-rewet fabric of claim 27,  
wherein said anti-rewet fabric comprises more than two layers.
- 15 29. The anti-rewet fabric of claim 28,  
wherein said anti-rewet fabric comprises a third backside layer that is very coarse.
30. The anti-rewet fabric of claim 28.  
20 Wherein a backside air distribution fabric layer is provided.
31. The anti-rewet fabric of any one of the preceding claims,  
wherein said anti-rewet fabric comprises a multi layer structure as follows: air distribution layer/perforated film layer and/or spectra  
25 membrane/air distribution layer/perforated film layer and/or spectra membrane.

32. The anti-rewet fabric of claim 31,  
wherein a final backside water holding air distribution layer is provided.
- 5 33. The anti-rewet fabric of any one of the preceding claims,  
wherein said perforated film layer comprises a polymeric or polyester film coated with adhesive on one or both sides and holes put through both the polymeric or polyester film and the adhesive.
- 10 34. The anti-rewet fabric of any one of the preceding claims,  
wherein each said air distribution fabric layer includes one of a plain weave and a multi-float weave.
- 15 35. The anti-rewet fabric of claim 34,  
wherein each said air distribution fabric layer includes a multi-float weave.
- 20 36. The anti-rewet fabric of any one of the preceding claims,  
wherein said perforated film layer has a series of perforate holes therein, each set of most-closely spaced perforate holes being separated by a perforate distance, each said air distribution fabric layer having a fabric weave associated therewith, said fabric weave having a weave repeat distance, said weave repeat distance being one of equal to and greater than said perforate distance.
- 25 37. The anti-rewet fabric of claim 36,  
wherein said weave repeat distance is greater than said perforate distance.

38. The anti-rewet fabric of any one of the preceding claims,  
wherein said perforated film layer has a series of perforate holes  
therein, said perforated film layer having about at least 40.000  
holes/m<sup>2</sup>.

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39. The anti-rewet fabric of claim 38,  
wherein said perforated film layer has a series of perforate holes  
therein, said perforated film layer having about at least 200.000  
holes/m<sup>2</sup>.

10

40. The anti-rewet fabric of any one of the preceding claims,  
wherein said perforated film layer or spectra membrane has an open  
area in the approximate range of 1 % to 30 %.

15

41. The anti-rewet fabric of claim 39,  
wherein said perforated film layer or spectra membrane has an open  
area in the approximate range of 5 % to 15 %.

42. The anti-rewet fabric of any one of the preceding claims,  
wherein said perforated film layer or spectra membrane has a thick-  
ness of less than about 0,04 inches.

20

43. The anti-rewet fabric of claim 42,  
wherein said perforated film layer or spectra membrane has a thick-  
ness of less than about 0,005 inches.

25

44. The anti-rewet fabric of any of the preceding claims,  
wherein each air distribution fabric layer is made of a sateen fabric.

45. A clothing for a press unit for dewatering a fiber web, comprising at least one anti-rewet fabric according to any one of the claims 27 to 44,  
wherein said at least one anti-rewet fabric includes a first anti-rewet fabric and said clothing further comprises a second fabric.
46. The clothing of claim 45,  
wherein said second fabric comprises a resistive layer, a perforated film layer and/or a spectra membrane, and an air distribution fabric layer.
47. The clothing of claim 45 or 46,  
wherein said second fabric comprises more than three layers.
48. The clothing of claim 47,  
wherein said second fabric comprises a multi layer structure as follows: resistive layer/perforated film layer and/or spectra membrane/air distribution fabric layer/perforated film layer and/or spectra membrane/air distribution fabric layer.
49. The clothing of any one of the preceding claims,  
wherein at least one fabric comprises at least two of perforated film layers and/or spectra membranes and the permeability is adjusted by the registration of the holes in successive perforated film layers or spectra membranes.
50. The clothing of any one of the preceding claims,  
wherein at least one fabric is constructed for pattern pressing.

51. The clothing of claim 50,  
wherein said fabric comprises a spectra membrane molded with the  
pattern.

5 52. A method of conveying a fiber web into an air press, said air press  
having a nip, said method comprising the steps of:  
providing an anti-rewet fabric for carrying the fiber web through  
said air press, said anti-rewet fabric comprising:

10 at least one air distribution fabric layer configured for contacting the  
fiber web; and

a perforated film layer and/or a spectra membrane, at least said  
perforated film layer being comprises of one of a polymeric or polyes-  
15 ter film and a plastic film, at least said perforated film layer having a  
first film side and a second film side, said first film side being one of  
laminated and attached to one said air distribution fabric layer, and

20 carrying the fiber web on one said air distribution fabric layer of said  
anti-rewet fabric into said air press through said nip.

53. A papermaking machine for making a fiber web, said papermaking  
machine comprises:  
a plurality of conveyor rolls for carrying the fiber web;  
25 first and second opposing press elements, said first press element  
and said second press element together forming a nip therebetween;  
at least a first anti-rewet fabric configured for carrying the fiber web  
through said nip, said first anti-rewet fabric including:

at least one air distribution fabric layer, one said air distribution fabric layer being configured for contacting the fiber web; and

5 a perforated film layer and/or a spectra membrane, at least said perforated film layer being comprised of a polymeric or polyester film, at least said perforated film layer having a first film side and a second film side, said first film side being one of laminated and attached to one said air distribution fabric layer, said second film side being directed toward one of said first and second opposing press.  
10 elements.

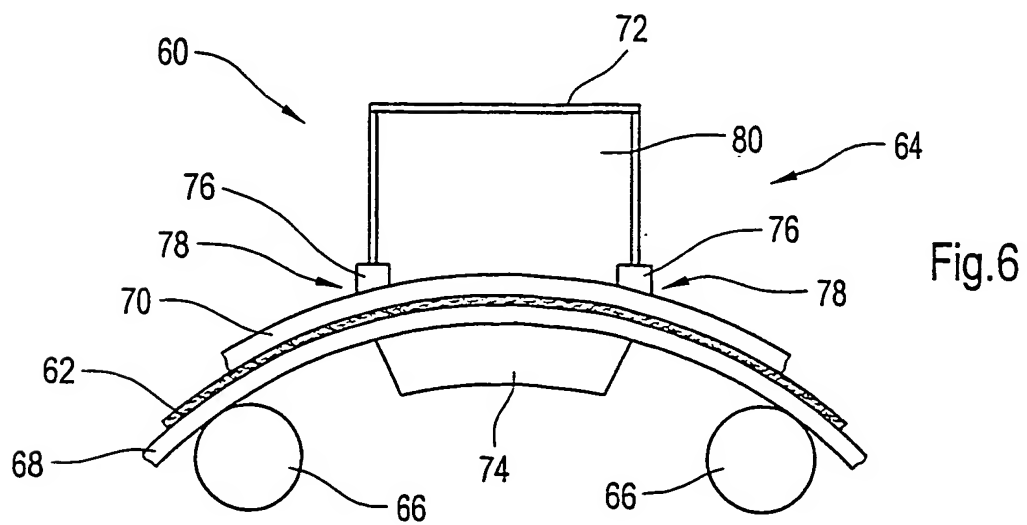
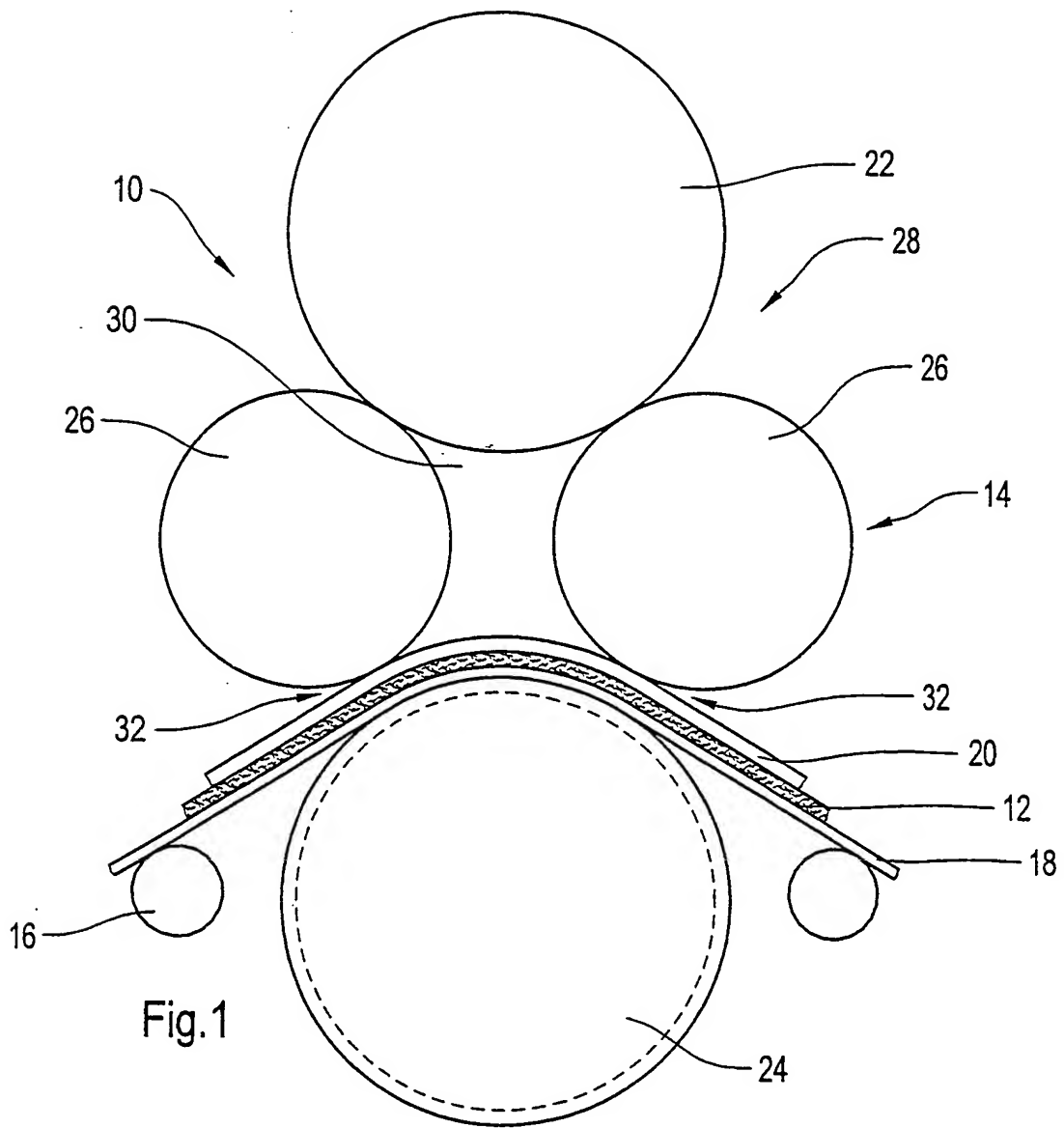
54. A method for dewatering a fiber web, the fiber web initially containing water therein, said method comprising the steps of:  
15 providing an air press for dewatering the fiber web, said air press having a nip and an air pressure chamber, said air pressure chamber having air under pressure therein;  
providing a first fabric and a second fabric for carrying the fiber web through said air press;  
20 carrying the fiber web between said first fabric and said second fabric through said nip and into said air pressure chamber of said air press; and  
displacing the water initially contained in said fiber web with the air in said air pressure chamber.

25 55. The method of claim 54,  
wherein at least said first fabric is an anti-rewet fabric, said anti-rewet fabric being configured for promoting only a one-way flow of

water therethrough, said one-way flow being directed away from the fiber web.

56. The method of claim 54 or 55,  
wherein at least one of said first fabric and said second fabric has a  
5 three-dimensional structure configured for creating an imprint  
thereof in the fiber web.

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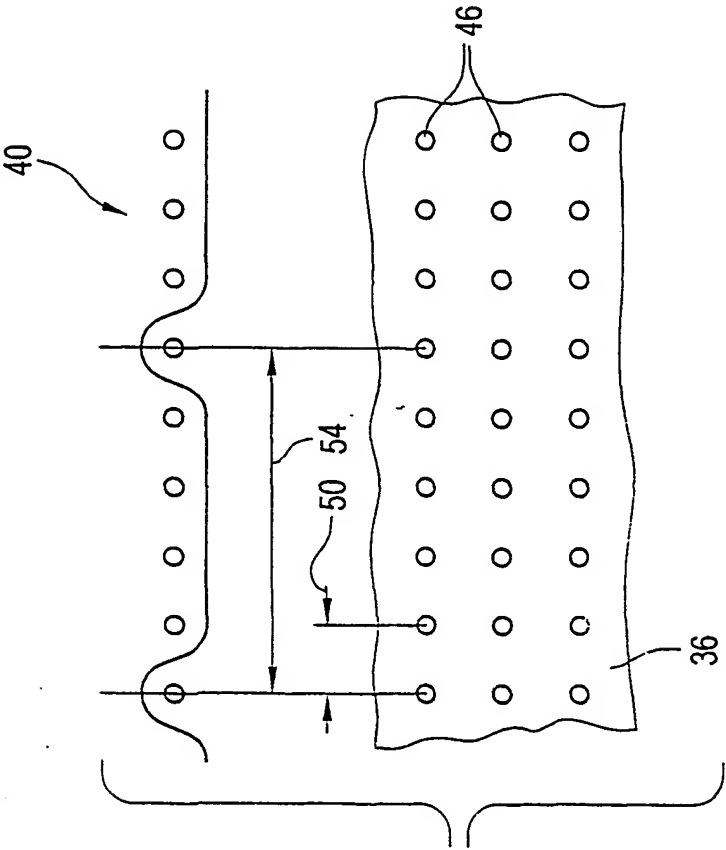


Fig. 4

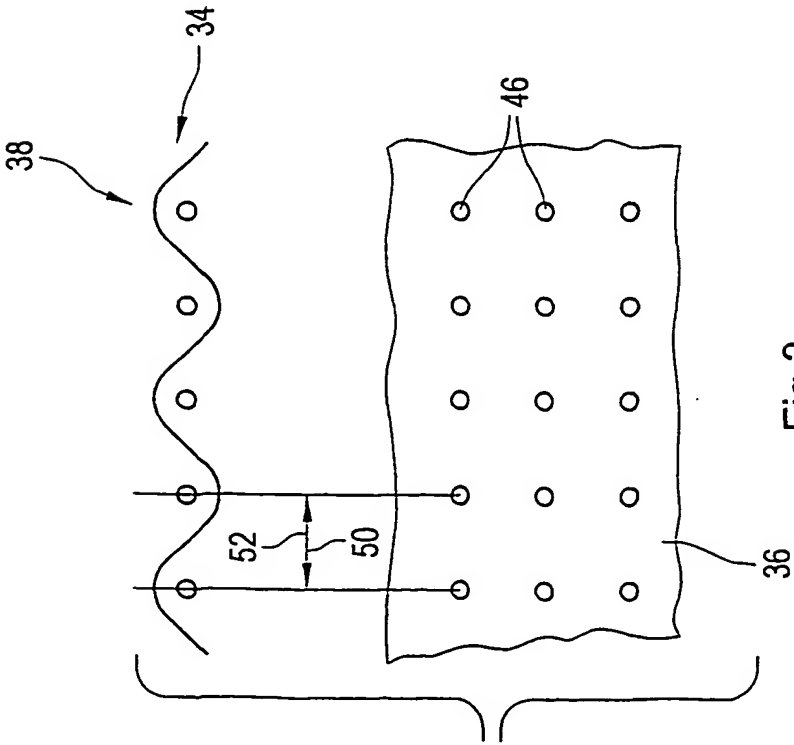
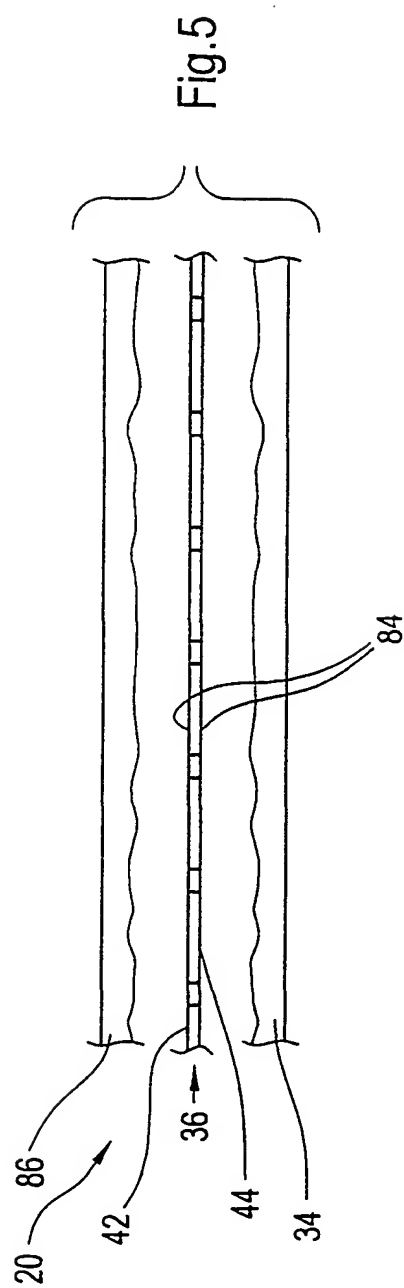
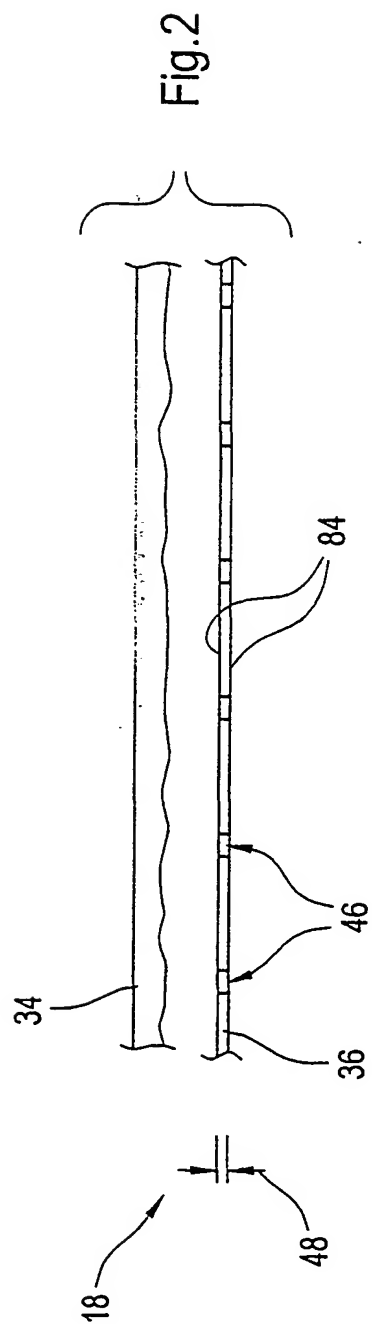


Fig. 3



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Fig.7

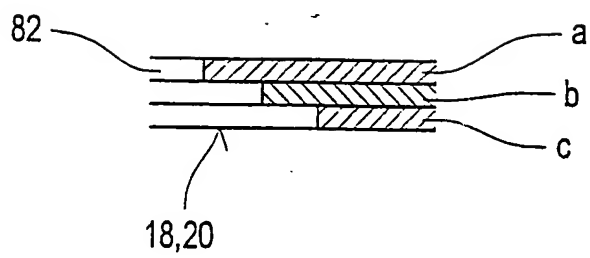
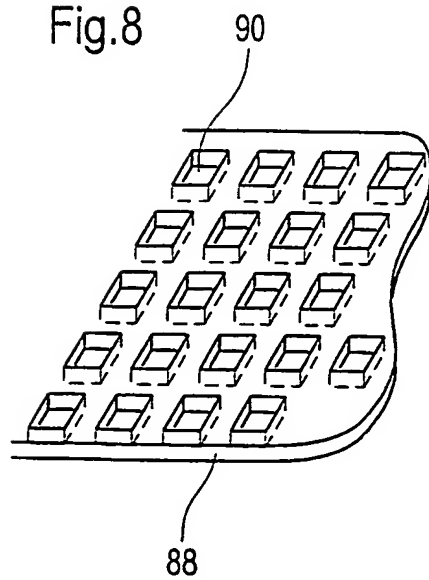


Fig.8



## INTERNATIONAL SEARCH REPORT

Internat Application No

PCT/EP 02/10771

A. CLASSIFICATION OF SUBJECT MATTER  
 IPC 7 D21F3/02 D21F1/48

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 D21F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	EP 1 088 933 A (VOITH PAPER PATENT GMBH) 4 April 2001 (2001-04-04)  figures paragraph '0082! - paragraph '0085! paragraph '0103!	54, 55  1, 27, 52, 53
X	US 6 231 723 B1 (KANITZ ROGER A ET AL) 15 May 2001 (2001-05-15) abstract; figures column 3, line 9 - line 51 column 5, line 5 - line 15  --- -/--	54, 56

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

16 January 2003

Date of mailing of the international search report

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## INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 02/10771

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 1088933	A	04-04-2001	DE 19946984 A1	05-04-2001
			DE 19946982 A1	05-04-2001
			EP 1088933 A2	04-04-2001
			EP 1088934 A2	04-04-2001
US 6231723	B1	15-05-2001	AU 5724500 A	18-12-2000
			FI 20012352 A	18-01-2002
			WO 0073581 A1	07-12-2000
			US 2002060049 A1	23-05-2002
WO 9923296	A	14-05-1999	AU 9593898 A	24-05-1999
			CA 2325908 A1	14-05-1999
			WO 9923296 A1	14-05-1999
			US 6306258 B1	23-10-2001
EP 1063349	A	27-12-2000	US 6350336 B1	26-02-2002
			AU 725003 B1	05-10-2000
			BR 0001322 A	13-03-2001
			CN 1277918 A	27-12-2000
			EP 1063349 A2	27-12-2000
			JP 2001003290 A	09-01-2001
			NO 20003238 A	27-12-2000
			NZ 501180 A	28-07-2000
			US 2002053391 A1	09-05-2002
			ZA 9907669 A	27-06-2000
EP 1087056	A	28-03-2001	US 6465074 B1	15-10-2002
			AU 741236 B2	29-11-2001
			AU 1001600 A	01-03-2001
			BR 0001323 A	03-04-2001
			CN 1286332 A	07-03-2001
			EP 1087056 A2	28-03-2001
			JP 2001098485 A	10-04-2001
			NO 20004246 A	26-02-2001
			ZA 200000236 A	02-08-2000